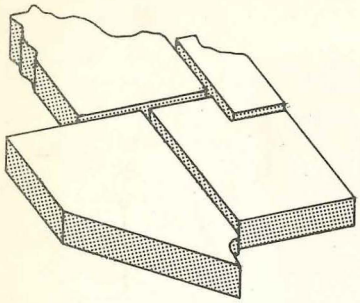

Research Note

Intermountain Forest & Range Experiment Station
Ogden, Utah

Reed W. Bailey, Director

Research Note No 5 August 1953

# STORAGE AND GERMINATION OF DOUGLAS-FIR SEED IN CENTRAL IDAHO

Alvin K. Wilson, Forester

At present very little information is available on the viability of Douglas-fir seed directly applicable to the inland form of the species in central Idaho

As a step toward acquiring these data, tests of seed collected on the Boise Basin Experimental Forest[1/] near Idaho City, Idaho were made in 1951 and 1952. Two collections of seed were employed in these tests The first was collected in 1937 and kept until used in sealed containers in insulated storage where annual temperatures range from 33 to 55 degrees Fahrenheit. No information was available on the exact location or maturity of the trees from which it was collected. The second collection was made in 1950 from mature trees growing at an elevation of 6,000 feet and was stored until testing in the same way as the first collection.

The 1937 seed was heavily infested with chalcid wasps (Megastigmus spermotrophys Wachtl) as shown by the presence of dead adults and the prevalence of emergence holes in the seed. Samples of seed without external evidence of chalcid infestation were subjected to cutting tests which showed that an average of only 35.7 percent of this seed was well-filled and apparently sound.

No evidence of the presence of chalcid wasps was found in the 1950 seed after two years of storage. Cutting tests showed that 82.3 percent of this seed could be considered sound.

In 1951 and 1952 germination tests on samples of these two collections were conducted. For the 1951 tests 900 seeds of each collection in 100-seed lots were stratified in moist sand for 43 days at temperatures ranging between 35 and 41 degrees F., followed by planting at 1/4-inch depth in shaded outdoor seed flats filled with screened, washed sand which was kept moist.

The 1952 germination tests included both stratified and unstratified seed of both collections. External indicators were again used on the 1937 seed so that only sound-appearing seed was tested. A total of 300 seeds of

---

1/ Maintained by the Intermountain Forest and Range Experiment Station, Ogden, Utah.

each collection in 100-seed lots were stratified as before while equal lots were kept unstratified in insulated storage until planting. Seeds subjected to both pregermination treatments were planted at the same time and in the same way as the previous year's tests.

Germination counts were made at 5-day intervals throughout the period of germination in both the 1951 and 1952 tests.

## Results

Neither the stratified nor unstratified seed of the 1937 collection produced any germination in either the 1951 or 1952 tests. The cutting tests indicated that only a small percentage of the otherwise sound-appearing seed had germination potentialities and the complete disappearance of viability shows that Douglas-fir seed cannot be stored by the method used here for periods as long as 15 years. Other evidence[2/] indicates that this storage method may be satisfactory for a period of 4 to 6 years and, where the temperature is held to 40° F., good for 7 to 8 years at the most.

The heavy infestation by chalcid wasps in the 1937 collection (estimated at 50 to 60 percent of the bulk seed) points out a possible circumstance that cannot well be avoided at the time of collection. The outer shell of the seed is formed after egg-laying has taken place and shows no outward sign of infestation until emergence of the adult the following spring.[3/] Seed collection at a number of separate locations should help reduce loss from this cause in any one season but the seed lots should be stored separately.

The results of the two tests of seed from the 1950 collection are summarized in table 1 which shows cumulative germination percentages at several intervals throughout the period of germination.

Average germinative energy in the 1951 tests of stratified seed, as measured by germination percent within 20 days of planting (76.9), is but slightly lower than the average of 80 percent quoted in the Woody Plant Seed Manual (p. 292). The zero germinative energy of the stratified seed in the 1952 tests is probably attributable in the 1952 planting time which was 1½ months earlier in the growing season than in the 1951 tests, resulting in lower average temperatures for the 20-day period after planting.

The lower average temperatures following planting also account for the longer period required in the 1952 tests for germination to be completed. However, the additional year's storage had no appreciable effect on total germination.

---

2/ Woody Plant Seed Manual. U. S. D. A. For. Serv. Misc. Pub. No. 654. 416 pp. 1948.

3/ Keen, F. P. Insect enemies of western forests. U. S. D. A. Misc. Pub. No. 273, 210 pp. 1938 (rev. 1939).

Table 1.--Cumulative germination percentages by periods following planting for Douglas-fir seed collected in 1950

| Days after planting | Stratified | | Unstratified |
|---|---|---|---|
| | 1951 Test (Basis: 900 seeds) | 1952 Test (Basis: 300 seeds) | 1952 Test (Basis: 300 seeds) |
| | percent | percent | percent |
| 20 | 76.9 | 0.0 | 0.0 |
| 30 | 77.7 | 72.0 | 0.0 |
| 40 | 77.8 | 74.0 | 2.0 |
| 50 | -- | 74.7 | 8.0 |
| 60 | -- | 75.3 | 29.3 |
| 70 | -- | 76.0 | 43.7 |
| 80 | -- | 77.0 | 51.3 |
| 90 | -- | 77.3 | 53.7 |
| Total germination (%) | 77.8 | 77.3 | 53.7 |

Although the early planting of seeds in 1952 was a contributing cause of zero germinative energy in both stratified and unstratified samples of the 1950 collection over the 20-day period, the effectiveness of stratification in hastening germination is demonstrated in table 1, with 72 percent germination of stratified seed within 30 days compared to zero germination for unstratified seed in the same period. Germination of unstratified seed was much slower and total germination was significantly lower than that for the stratified samples.

## Summary

In 1951 and 1952, germination tests were conducted on samples of Douglas-fir seed collected in 1937 and 1950 on the Boise Basin Experimental Forest in central Idaho. No germination occurred in either stratified or unstratified seed of the 1937 collection despite the care taken to avoid using obviously unsound seed. The evidence gathered here together with that from other studies strongly suggests that Douglas-fir seed cannot be stored satisfactorily even in sealed containers in an insulated building for more than 4 to 6 years.

With seed of the 1950 collection, stratification produced marked improvement in both germinative energy and germinative capacity (77.3%) over that for unstratified seed (53.7%).